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monium is the general prototype, the hydrogen of that volatile base being replaced to the extent of one, two, three, or four equivalents, by a multitude of elementary and compound radicals. Your method, also, of introducing these radicals into the constitution of ammonia, by the agency of the bromides and iodides of the radicals, has been found to admit of extensive application, and has very materially assisted in the general progress which organic chemistry has made since this method was made public.

DR. NEIL ARNOTT,

I have much pleasure in announcing, that a Rumford Medal has been awarded to you, "for your construction of a new Smoke-consuming and Fuel-saving Fire-place, with accessories, ensuring the healthful warming and ventilation of houses, lately described in the *Journal of the Society of Arts* (May 12, 1854), and for your various contributions to the elucidation of the principles and improvement of the practice of heating and ventilation."

The President then called upon Dr. Sharpey to read the following obituary notices of some of the deceased Fellows :—

EDWARD FORBES.—In the melancholy list of those who have passed away from among the Fellows of this Society, there is no name whose mention will awaken a more general and profound feeling of regret than that of EDWARD FORBES. Some leave us full of years and honours, their work in this world finished, and its rewards enjoyed ; the sphere of action of others has been so limited, that their absence is felt within only a narrow circle ; but in Edward Forbes we have to lament one whose vigorous intellect had but just attained the ripeness of the prime of life ; who, after rising with almost unexampled rapidity to the height of his ambition, sank within sight of a future more brilliant than his past ; and whose loss to the brethren in science who looked up to him, to the University whose hopes were centred in him, and to the friends of all classes and pursuits who loved him, is truly irreparable.

A native of the Isle of Man, and born in the year 1815, Edward Forbes exhibited at a very early age that aptness for and attach-

ment to intellectual pursuits, so commonly remarked in those who attain to scientific eminence. Before his twelfth year, we find the boy already collecting and cataloguing the curious and beautiful things scattered along the shores of his native island, and even boldly venturing, without other guidance or encouragement than such as were afforded by the vigour and hopefulness of a fresh and youthful mind, amidst the mazes and difficulties of a science then in its infancy,—that Geology to whose advance it was his destiny in after life so essentially to contribute. And the fine healthy audacity with which, in these childish days, he undertook to compile a Manual of British Natural History in *all* its branches, and carried out his project, according to his means and powers, is worthy of note, and might have led a judge of human nature to prophecy well of his future.

The complexion of this future, however, was for a time doubtful. The tendencies of Edward Forbes's mind were always as strong towards art as towards science; and, in very early life, the former appear to have been the stronger, for we find him taking up his residence in London as an Art-student, under the guidance of the late Mr. Sasse. These labours in the studio were not of very long duration; but, short as they were, the development which they gave to a naturally great power of drawing, and the critical eye for form which they conferred, proved of essential importance to the future Naturalist and Professor. Again, the readiness with which Forbes's rich and overflowing humour embodied itself in sketches, vignettes, and caricatures,—a facility which lent no small charm to many of his published works, and has left many a pleasant memorial among his friends—must be regarded as not a little due to this early training.

However, the scientific tendency of Edward Forbes's mind appears to have been too strong to allow of any lasting or exclusive attachment to other pursuits; and in 1830 he left London and Art, to commence, as a student of medicine, the curriculum of the University of Edinburgh. It is hardly probable that he ever seriously looked forward to the practice of physic as a profession; for, although a diligent attendant upon the prescribed courses, he never presented himself for his degree. But even if it were so, his inborn genius, fostered by the teachings of a Jameson and a Graham, soon diverted

his attention from the hospital and the operating theatre to the museum and the field, and led him to the conviction that the pursuit of knowledge for its own sake was the only satisfactory sphere for his activity, and that in devotion to science lay the vocation of his life.

An exploration of Norway, and the publication of a fauna of his native shores, were among the first fruits of Edward Forbes's scientific training. These were succeeded by excursions into Algeria and Illyria, and by a stay of some months in Paris, where Prévost was teaching geology, and Geoffroy and De Blainville zoology. In 1840, Forbes published the first work by which he will be remembered, 'The History of British Starfishes,' one of a series of monographs upon the natural history of this country which do honour to its zoologists. Although consisting of little more than a description of a score species of Echinoderms, this is, in many respects, an important and remarkable Essay; and it must be considered to be by no means its least merit, that, with an extent and thoroughness of knowledge rarely exceeded, it unites a spirit of playful and elegant humour, rare in itself, and still more rare in such combination. Repudiating that stilted and pretentious solemnity sometimes thought essential to the due preservation of the dignity of science, Edward Forbes here exemplifies the doctrine upon which his whole life was a commentary,—that a true philosopher must first, and before all things, be a genial and simple-minded man.

Mr. Forbes spent the succeeding two years as Naturalist in H.M.S. *Beacon*, then commanded by Capt. Graves, the chief of the surveying corps at that time employed in the Mediterranean. At this time Capt. Graves was more particularly occupied with the *Ægean* Sea, and for a short period he was engaged in affording assistance to Sir Charles Fellowes's expedition in Lycia. Availing himself of the opportunity thus afforded, Mr. Forbes, in company with Lieutenant (now Captain) Spratt and the Rev. Mr. Daniell, made many excursions inland. The terrible fevers of the Levant did not spare the travellers; and while one of his companions fell a victim to their virulence, Forbes's own life was at one time despaired of, and he always considered his constitution to have been permanently injured by the attack.

The results of these combined explorations, by which the forgotten

sites of many ancient cities were determined, were eventually published by Messrs. Spratt and Forbes; but these 'Lycian Travels,' however interesting, must be considered as of very secondary importance, so far as Edward Forbes is concerned, to the results of his examination of the shores of the *Ægean* with the dredge, an instrument of great simplicity indeed, but with whose value he had early acquainted himself. It was upon the data obtained by dredging during his cruises that he based that remarkable 'Theory of the Bathymetrical Distribution of Life' with which his name will always stand most prominently connected in the annals of science.

That zones of distinct species of living beings may be shown to exist at different depths in the sea—just as corresponding zones are demonstrable at different heights on the land,—is a proposition which had been clearly enunciated by Audouin and Milne-Edwards so long ago as 1832, and subsequently, on independent grounds, by Lovén. But, for the addition of new zones, for their accurate enumeration and definition, and above all, for the practical application of the 'Theory of Distribution in Depth, of Marine Life,' to the solution of geological problems, we are entirely indebted to Edward Forbes.

It is impossible to estimate too highly the value of the 'Theory of Bathymetrical Distribution' as a contribution to scientific natural history; and it is greatly to be regretted that the details of the *Ægean* researches, from which the theory was constructed, have never been published. A sum of money was granted by Government for the purpose, but the pressure of new avocations and other practical difficulties interfered. Nevertheless, Mr. Forbes always looked forward to the working up and publication of these his early and favourite investigations; and doubtless, the hoped-for leisure to carry out his plans was one of the many attractions which the Chair of Natural History in Edinburgh offered. But these projects were destined to have no fulfilment; and Forbes's views have but an incomplete representation in the 'Reports of the British Association' and the 'Memoirs of the Geological Survey of Great Britain.'

Edward Forbes's studies at the University were on the widest scale; and like the father of Natural History, he attacked with equal ardour Mineralogy, Botany, and Zoology. Good authorities affirm that his knowledge of mineralogy was of no small extent; as a

zoologist, all know his merits; and as a botanist, his acquirements were so well thought of, that during his absence in the East, the Chair of Botany at King's College, London, vacated by the death of the lamented Professor Don, was, without solicitation on his part, conferred upon him. The intelligence of this appointment put an end to his meditated project of further travel in Egypt and on the shores of the Red Sea, and Professor Forbes returned to enter upon the duties of his post in 1843.

Launched into the great world of London, Forbes's further progress was not more due to his intellectual than to his moral characteristics. His singular sociality and geniality, the gentleness of his manner, and his ready sympathy with and comprehension of all phases of human character, won for him a prominent place, whatever the society into which he was thrown. Among his fellow-students, Edward Forbes was the leader,—whether the thing to be done were the editing of a mock 'Maga,' the writing and illustrating a song, or a downright piece of hard work. He had no quarrels himself, soothed them among others, and altogether kept men together as no one else could do.

It was these rare peculiarities which, together with his high intellectual qualifications, recommended him to the authorities of the Geological Society, when a vacancy occurred in the Curatorship of their Museum.

Professor Forbes accepted this post in 1842, and availing himself of the opportunities for the study of palæontology thus afforded him, he soon distinguished himself in the field to which henceforth his energies were principally directed. In fact, when in 1844 he resigned his Curatorship, it was to join the Geological Survey of Great Britain, under the direction of Sir Henry De la Beche, and to take the official position of Palæontologist to the Survey, a post in discharging whose duties he spent the next ten years of his life.

When the Museum of Practical Geology and the Government School of Mines were established—growing as they did out of the Survey,—Prof. Forbes directed the arrangement of the beautiful collection of fossils now displayed in the former, and became Lecturer on Natural History and Palæontology in the latter part of the Institution in Jermyn Street. At the same time, many valuable contributions to the 'Transactions of the Geological Society,' to the

memoirs published by the officers of the Survey, to the beautifully illustrated 'Decades,' in which Prof. Forbes's artistic skill and judgment are so manifest; his Monograph on the British Naked-eyed Medusæ, published by the Ray Society; and the large work on the 'Natural History of the British Mollusca,' undertaken and finished in conjunction with Mr. Hanley—are sufficient evidence that his active mind was not one of those which are oppressed and overpowered by details.

Among these many contributions to science there are two so marked by originality and genius, so pregnant with results for the future, as to deserve more than passing notice. The first of these is the 'Essay on the Distribution of the Fauna and Flora of the British Isles,' in the first volume of the Memoirs of the Survey, which may be characterized as one of the happiest applications of the facts of one science to the elucidation of the difficulties of another that has ever been made. The doctrine laid down in this memoir is, that the existing distribution of animals and plants can only be regarded, not as a primary and independent phenomenon, but as the result of previously existing conditions,—as the product, in fact, of two factors; the one, the successive changes of living beings in time; the other, the successive changes of the position and boundaries of land and sea in space.

The second work here adverted to is that remarkable Essay on the Tertiary Beds of the Isle of Wight, the fruit of Prof. Forbes's last labours.

By an elaborate study of the Purbeck beds in Dorsetshire in 1850, Prof. Forbes had come to the unexpected conclusion that they were divisible into three formations, each characterized by distinct sets of fossil remains; and that the freshwater mollusca and foraminifera of the Purbeck beds, to which he had given his more particular attention, did not agree specifically with the fossils of the incumbent Hastings Sands. The latter he proposed to class as Lower Cretaceous or Neocomian, while the Purbeck he henceforth considered as an uppermost member of the Oolitic group. His great success in these researches awakened in him a lively curiosity to examine in like minute detail the great series of tertiary freshwater strata occurring in the northern part of the Isle of Wight. Accordingly, he devoted several months in the autumn and winter of 1852 to the

exploration of that complicated succession of freshwater and fluvio-marine beds; and when we reflect how many able geologists had gone before him in this field, we may well marvel at the richness of the harvest which he reaped. Among other novel conclusions, he showed that certain strata called the Headon beds in Alum Bay had hitherto been incorrectly identified in age with the Bembridge limestone of Whitecliff Bay at the opposite or eastern end of the island. These Bembridge beds, which belong to the same division as the well-known calcareous building-stone of Binstead, were recognized as the true equivalents in age of the celebrated gypseous series of Montmartre near Paris, containing similar remains of Paleotheria and other extinct quadrupeds, which Cuvier had long before described. It followed from the correction here alluded to, that the mammiferous fauna of Binstead held a much higher place in the Eocene series than the Headon beds, and, consequently, than the contemporaneous Hordwell strata of Hampshire, in which other quadrupeds than those of Binstead, including amongst them the *Palæotherium* of Owen, had been detected. Between these two divisions, called by Forbes the Bembridge and the Headon, he found another, which he called the Osborne or St. Helen's series, also of fresh and brackish-water origin, and distinguished by peculiar species of mollusca.

In addition to all these results, Prof. Forbes brought to light an entirely new member of the British tertiary series, hitherto overlooked. Near Yarmouth, in the Isle of Wight, the most elevated ground formed by tertiary deposits is called Hempstead Hill, in which strata corresponding in their fossils with the Limburg beds of Belgium or the Grès de Fontainebleau in France, were recognized. These would be classed by many geologists of the continent as Lower Miocene; but Prof. Forbes inferred, from the gradual passage which he traced between them and the subjacent Bembridge series, that the whole should rather be regarded as Upper Eocene. In a word, he declared it to be impossible, without drawing an arbitrary line of demarcation, to denominate the Bembridge beds Eocene, according to received usage, and to distinguish the Hempstead strata as Miocene.

Always an active and influential member of the Geological Society, Prof. Forbes became its President in 1853. His anniversary address

for that year contains a sketch of a remarkable theory with regard to the relation of the past and present faunas of the world to one another,—the Theory of the Polar Development of Life in Time.

Prof. Forbes's occupation of the Presidential Chair in the Geological Society, however, was but short; for in the spring of 1854, the death of Prof. Jameson placed within his reach the ambition of his life,—the Chair of Natural History in the University which had been his *alma mater*. Appointed and called upon to enter at once on the duties of this distinguished office, he commenced with what an eminent fellow-worker has well called "the light-hearted intensity peculiar to himself," to conceive and to inaugurate plans of a magnitude proportioned to his great powers and noble aspirations. But a slow, though mortal disease—suspected least of all by himself—had long been undermining his constitution; and its sudden outbreak, accelerated by over-fatigue and cold, carried him off, after a very short illness, on the 20th of November, 1854. He was buried at Edinburgh, with such great public demonstrations of respect as have been rarely shown, but which after all but faintly represented the profound and universal sorrow.

REAR-ADMIRAL SIR JOHN FRANKLIN, K.C.H., D.C.L. ETC.—Although the unauthenticated intelligence brought recently to England by Dr. Rae respecting Sir John Franklin and his companions does not raise the veil of mystery which shrouds their fate, yet the touching relics of that gallant commander and his brother-officers are unhappily of a nature, not only to awaken the most gloomy thoughts, but to forbid us entertaining any longer the cherished hope that they may be restored to their country.

At an early period of this year, long before the Expeditions which were sent to search for the 'Erebus' and 'Terror' could have returned, and of course prior to the receipt of the recent Esquimaux report, the Admiralty removed the names of Sir John Franklin, his brother-officers and crew from the Navy List. This official act, and the recent melancholy tidings bearing upon their fate, have rendered it necessary to include in the list of deceased Fellows the names of Sir John Franklin and Captain Crozier, both of whom there is too much reason to apprehend have perished in their heroic endeavours to bring to a successful issue the great enterprise confided to them.

Sir John Franklin was descended from a respectable Lincolnshire family, who occupied a small estate for several years in that county. In consequence of the improvidence of his grandfather, Sir John's father was obliged to enter into business, in which he was so successful as to have been enabled to give his sons a good education. One, Sir Willingham Franklin, rose to the rank of a Chief Justice of Madras; another, Major Franklin, of the Bengal Cavalry, was distinguished for his scientific geographical knowledge, which obtained for him the Fellowship of this Society.

The fourth son, the subject of this notice, who was born at Spilsby in Lincolnshire in 1786, was intended for the Church, but while still at school, he took advantage of a holiday to run from Louth to the coast for the purpose of seeing the ocean, on which it is stated he gazed for hours with wonder and delight. His father, who was extremely desirous that his son should not follow the profession of a sailor, for which he manifested the strongest partiality, conceived that by sending the boy in a small merchant-ship to Lisbon, the discomforts of the voyage would effectually cure him of his love for the sea; but in the case of young Franklin, as in many others, this expedient had a totally different effect, so that being evidently bent on a maritime career, he was entered as midshipman on board the 'Polyphemus' in 1800, and was in that ship at the battle of Copenhagen. On this occasion he escaped without a wound, while a brother midshipman was killed at his side.

He next sailed with his maternal cousin Captain Flinders on his celebrated voyage of discovery to Australia, during which he acquired most of that skill and knowledge which was of infinite value to him in after-life.

In the course of this survey he had the misfortune to be wrecked with his commander on a coral reef in August 1803, and by his conduct during seasons of great hardship gained the praise and esteem of his superior officers.

Franklin next acted under Captain Dance in the 'Earl Camden,' and had charge of the signals during the celebrated engagement in the Straits of Malacca, with the French Admiral Linois.

On his return to England he was appointed to the 'Bellerophon,' Captain Loring, in which ship he had the honour of acting as signal midshipman in the memorable battle of Trafalgar; a post of great

danger, as the 'Bellerophon' was engaged yard-arm to yard-arm with the 'Aigle,' a French seventy-four, and during the action the poop where he was stationed was repeatedly swept by the enemy's musquetry. Out of forty companions, only six, beside himself, escaped without wounds or death.

During the subsequent two years, Franklin, who was now mate, served in the Channel Fleet and the Rochefort Squadron, under Admiral Cornwallis, Lord St. Vincent, and Sir Richard Strachan.

He then joined the 'Bedford,' one of the convoy which escorted the Emperor of Brazils to South America. Immediately afterwards, he sailed in the Expedition against New Orleans, where he distinguished himself particularly in the attack on the American gun-boats, on which occasion he was wounded. His heroic conduct in this gallant affair was prominently mentioned in the official despatches, and led to his being promoted to a Lieutenancy in the 'Forth,' which ship conveyed the Duchess d'Angoulême to France on the restoration of the Bourbons.

In 1818 commenced the brilliant series of Arctic Expeditions with which Franklin's name is so honourably associated. From the moment of their having been projected he evinced the strongest desire to be engaged in them, and he was indebted to Sir Joseph Banks, at that time President of the Royal Society, for the gratification of his wishes.

It has been stated, that, with the view of proving himself qualified for surveying operations, Franklin surveyed a portion of the City of London by triangulations taken from church steeples and towers, and that he was in a great measure indebted to the successful result of this undertaking for Sir Joseph Banks's patronage and support.

Sir Joseph, who had considerable influence with the Admiralty in all matters relating to Arctic exploration, strongly recommended his young friend for Arctic service, and he was accordingly appointed to the command of the 'Trent.' This ship, with the 'Dorothea,' formed an expedition under the command of Captain Buchan, the object of which was to attain the North Pole, and to enter the Pacific through Behring's Strait. The ship sailed in the early part of 1818, and reached the latitude of 80° 34' North, when the 'Dorothea' became disabled by severe pressure from the ice, and was incapable of proceeding further. But, although dangers of the most appalling

nature were around Lieut. Franklin, yet as his ship was less damaged than that of Captain Buchan, he earnestly requested permission to proceed alone in the execution of this discovery. The nature of Captain Buchan's instructions prevented this, and the Expedition returned.

Immediately on his return he was appointed to the command of that celebrated Expedition to explore the North American coast, which occupied the years 1819, 1820, 1821, and 1822, the history of which, as told in his own manly and unaffected language, is undoubtedly one of the noblest pictures of heroic exertion and patient endurance.

The results of the labours of Franklin and of his distinguished associate Sir John Richardson, in this memorable journey, deserve more full and fitting recognition than can be attempted on this occasion; suffice it here to observe, that a vast extent of the North American Continent, before unknown, was added to our Charts, and large acquisitions gained for science by the careful study of the physical geography and natural productions of that portion of the globe.

Undeterred by the appalling sufferings he had already undergone, Franklin, although lately united in marriage to Miss Porden, again volunteered his services for Arctic exploration. These were accepted, and in the course of 1825-27 an additional tract of the North American Continent was carefully surveyed.

For these arduous services, which extended over a period of twelve years, and in the execution of which he travelled nearly 9000 miles, and added a coast-line of upwards of 1200 miles to our North American Maps, he was promoted to the rank of Captain, knighted by his Sovereign, and had the degree of D.C.L. conferred on him by the University of Oxford. He also received the Gold Medal from the French Geographical Society, and was elected a Fellow of the Royal Society, on whose Council he served in 1829 and 1830.

In the former year, having had the misfortune to lose his first wife, he married the present Lady Franklin, then Miss Jane Griffin, whose persevering devotion in endeavouring to rescue her unfortunate husband is well known.

He now remained at home for two years, when he was appointed to the 'Rainbow,' and served in that ship in the Mediterranean for

three years. He was chiefly employed in the Greek waters, and had the good fortune to be of considerable service in the delicate adjustment of complicated diplomatic relations.

During this period, as indeed on all other occasions, he eagerly availed himself of every opportunity, not only to improve his knowledge of geology, to which science he was greatly attached, but also used every exertion to add to the museum of the Geological Society and to the private collections of scientific men.

After a brief period of rest, which followed his services in the Mediterranean, he applied to Lord Glenelg for employment under the Colonial department, and his Lordship, in a very complimentary manner, offered him the important post of Governor of Van Diemen's Land, which he held for seven years.

During this time, that Colony received the convicts sentenced to transportation, New South Wales having ceased to be a penal settlement, which rendered Sir John Franklin's position most onerous and trying. But he acquitted himself so entirely to the satisfaction of the colonists, that in grateful remembrance of his government, which was marked by the establishment of a College and a Philosophical Society, they, unsolicited, subscribed £1600 towards the expenses of the recent private expedition fitted out for his rescue.

It might be supposed that after so long a period of laborious services, Sir John Franklin would have desired repose, particularly as he had now attained high renown; but his wishes still pointed towards active employment, and consequently, when the Arctic Expedition was contemplated, which in all human probability has cost him his life, he was willing and ready to take the command, when the Admiralty were of opinion that he was the officer best fitted to act as its chief.

That Expedition, as will be remembered, was originated by the late Sir John Barrow, who, before resigning his office of Secretary to the Admiralty, submitted a plan for the discovery of the North-west Passage to that branch of Her Majesty's Government, by whom it was referred to the Council of the Royal Society.

Without concurring in all Sir John Barrow's views, the Council gave it as their opinion that such an Expedition was likely materially to increase our knowledge of geography and terrestrial magnetism, and to promote the general interests of science, and that it was at

that time peculiarly desirable in connexion with the magnetical inquiries then in progress.

The history and fate of the Expedition, which left our shores in May 1845, are still veiled in obscurity; this, however, we know, that every thing was done to render it efficient,—that the officers under Sir John Franklin were men of experience and zeal, and that the last accounts which were received from them represent their commander as animated by all the ardour and spirit which characterized his early Arctic exertions.

It would have been unjust to have expected less from such a man, and as his instructions contained the usual discretionary latitude given in these documents, there is too much reason to fear that in his great anxiety and daring attempts to solve the problem of the North-west Passage, his ships became inextricably entangled in the thick-ribbed ice of the Arctic regions, and his attempts to reach the North American continent were rendered abortive.

But although the few facts that have reached us point to the dreary shores of the Arctic regions as the final resting-place of our lamented Fellow and his brave companions, his memory will ever be enshrined on British land within British hearts, as an explorer as eminent in discovery, as he was patient under trial and privation, and kind and good in all the relations of life.

CAPTAIN FRANCIS RAWDON MOIRA CROZIER, R.N., the companion of Sir John Franklin on his last and fatal voyage, and second in the command of the expedition, was eminently qualified for the post by long experience in the navigation of the icy seas.

He accompanied Sir W. E. Parry on his last three voyages to the Arctic Regions, and was made Commander for his services as First Lieutenant of H.M.S. 'Cove,' under Captain James Clark Ross, and despatched in the depth of winter to afford assistance to the missing whalers supposed to have been frozen in the pack of Davis Strait.

Again, as second in command to Captain J. C. Ross, he obtained post rank for the first season's successful operations of the expedition sent, at the recommendation of the Royal Society and British Association, for purposes of scientific research and geographical discovery to the Antarctic Ocean.

Captain Crozier was distinguished for devotion to his duties as an

officer, zeal for the advancement of science, and the untiring assiduity and exactness of his magnetic and other observations. The Transactions of the Royal Society, as well as the published results of the Antarctic Expedition, bear ample testimony to his diligence and ability.

ROBERT JAMESON was born at Leith on the 11th of July 1774. Of his early years it is reported that he showed a decided bent towards the study of external nature, and although he went through the course of apprenticeship and college study then usual for young men entering the medical profession, he never engaged in practice, but devoted himself to the pursuit of natural history as the main occupation of his life.

The first fruits of his labours as an original inquirer were given to the world in his "Outlines of the Mineralogy of the Shetland Islands and of the Island of Arran," published while he was yet a very young man; and this was followed by a more important work entitled the "Mineralogy of the Scottish Isles," and containing the results of further local investigation. The success of these early essays served only as an inducement to extend and deepen the foundations of his knowledge, and with this view he spent nearly two years in the great school of mining and mineralogy at Freyburg, under the tuition of the celebrated Werner. Returning home from Germany, he was appointed in 1804 to the chair of Natural History in the University of Edinburgh, which had become vacant by the death of his early friend and preceptor, Dr. Walker. When thus established as a teacher in the chief seat of learning in his native country, he seems to have early entertained the project of a great work on the Geology of Scotland, in which the whole was to be described, county by county, and he made a commencement with "The Mineralogy of Dumfries." From this undertaking, however, he was soon called off to prepare various elementary and systematic works for the geological student; and accordingly a treatise "On the external Characters of Minerals," and a "System of Mineralogy and Geognosy" soon appeared from his pen, and, after a longer interval, his "Manual of Mineralogy and of Mountain Rocks." He also contributed several articles on different branches of Natural History to the Edinburgh Encyclopædia and

Encyclopædia Britannica, and to the Transactions of the Wernerian Society, of which he was the founder. In 1819, in conjunction with Dr., now Sir David Brewster, he commenced the Edinburgh Philosophical Journal, which was afterwards continued, under his sole editorship, under the title of the Edinburgh New Philosophical Journal, and this duty he continued steadfastly to perform to the end of his life.

Mr. Jameson's strong point was Mineralogy; and as he held a knowledge of minerals to be valuable chiefly as subservient to practical geology and mining, he paid less regard to chemical than to external characters in the definition and determination of mineral species. His consummate acquaintance with the mineral characters of rocks stood him in good stead in the great controversy of which Edinburgh became the centre, between the respective supporters of the Plutonian and Neptunian theories of the earth. Trained in the school of Werner, and deeply reverencing his great master, Mr. Jameson naturally imbibed his views; and though he eventually became convinced of their insufficiency, and candidly avowed his change of opinion, it is admitted that the doctrine which finally triumphed gained much in solidity and precision by the searching ordeal to which it had been subjected at the hands of its accomplished opponent.

His College lectures owed no attraction to language or delivery, but the solid instruction imparted secured the earnest attention of his audience. His success as a teacher, however, was greatly due to his field lectures and geological excursions with his pupils in the country round Edinburgh, so rich in visible illustrations of geological science. These practical outdoor instructions, conveyed as they were in perspicuous and impressive language, and followed up by easy and unrestrained colloquial explanation, became the means of infusing a love for the study in many of his youthful followers, and of sending forth active and well-prepared geological labourers to most parts of the world.

Mr. Jameson was a member of many learned societies both at home and abroad; he was elected a Fellow of the Royal Society in 1826. In private life he was much esteemed and could reckon many attached friends. His death took place on the 19th of April 1854.

The Society has lost another distinguished member in GEORGE NEWPORT, who died in April last.

The earlier incidents of Mr. Newport's personal history, although simple in themselves, are well deserving of record, as important passages in the life of one who, through inborn love of knowledge, just confidence in his own powers, indomitable energy and rigorous self-denial, raised himself to eminence from a humble walk of life, in spite of the difficulties he had to encounter from the want of early training and other aids which a more advantageous social position supplies.

George Newport was born on the 4th July 1803, in the city of Canterbury, where his father was a wheelwright, and at that time in comfortable worldly circumstances. The son gave early indications of mental activity, showing, as soon as he could read, a great fondness for books, and also a taste for drawing. This latter taste, though never aided by external cultivation, abode by him through life, and proved of great use to him in his subsequent studies by enabling him to represent accurately, and at the moment, the subjects of his investigation.

At the usual age he was sent to a day-school in Canterbury, where he received the ordinary English education obtainable by boys in his station of life. When he had reached his 14th year he was removed from school, and, very much, it is said, against his will, was bound apprentice to his father. Although he soon became an expert workman in the lighter branches of the trade, he never got the better of his dislike to the occupation, and often avowed his purpose of abandoning it at the expiration of his apprenticeship.

Before this period arrived, however, his future prospects, humble as they were at best, became still more clouded. His father, it is said from no fault of his own, but from unavoidable circumstances, became involved in pecuniary difficulties, and the whole of his little property had to be sacrificed for the benefit of his creditors. Under this change of circumstances, the son, instead of seeking, as he had hoped to do, for some more intellectual employment, was compelled to continue at his father's trade, and by working hard for three or four days in the week, he earned sufficient to enable him to devote the remaining days to pursuits more congenial to his mind. These were chiefly—reading on general subjects both literary and

scientific, the study of antiquities, for which the locality afforded great opportunities, and, most of all, the pursuit of his earliest and latest love, the observation and investigation of insect life. He had been a collector of insects from his early boyhood, but it was during the two years of comparative leisure following the close of his apprenticeship (from about July 1824 to November 1826), that his entomological studies assumed consistency and form.

The Canterbury Philosophical and Literary Institution afforded means of instruction of which George Newport, at this time, took full advantage, having joined it as a member in 1825. Its library, its collections, both in natural history and antiquities, and its lectures, were to him the source of endless recreation and instruction,—advantages, which he was soon able to repay, in kind, by contributions both to its museum and theatre. In September 1825 he began an elementary course of lectures on mechanics, and gave other lectures on the same subject, at intervals, both during this and the subsequent session of 1826; and in October of the latter year he was appointed General Exhibitor of the Museum, with a small salary. During this and the following year he gave some general lectures on entomology, as well as numerous demonstrations on the same subject, from his own collections and the specimens in the museum; and his name stands on the books of the Society as a large donor of British insects collected and preserved by himself.

Mr. Newport gave much satisfaction in his management of the museum, and made numerous friends among its chief visitors, the young men of the city, several of whom, subsequently, gave a striking proof how highly they estimated his character and services. Among the members, and one of the occasional Honorary Lecturers of the Society during the time of Mr. Newport's curatorship, was a Surgeon then residing at Sandwich. The intimacy arising from position and from pursuits of a kindred character, led to a connexion which ended in Mr. Newport's leaving Canterbury and going to reside at Sandwich; Mr. Weekes agreeing to receive him as his apprentice without the payment of any premium, but also without any remuneration for services, even in the form of board and lodging. All that he had of present or prospective means to meet the exigencies of such a position, consisted of a small sum in hand set apart from his own scanty earnings, and the generous offer of such

contributions from his young friends in Canterbury as their very moderate resources could supply.

This period of Mr. Newport's life was marked by the greatest privations, and he often, in after years, expressed some surprise how he was able to bear up against them. Whatever his expenditure was (and it was marvellously small), it was still supplied by the same attached friends at Canterbury. It is pleasing to be able to add, that all these precious debts were carefully recorded by him, and gradually liquidated, in after years, as the means of doing so came slowly into his possession.

At the expiration of his apprenticeship, Mr. Newport went to London to prosecute his medical studies. Through the friendly intervention of a Physician, to whom he had been fortunate enough to gain an introduction, he obtained a nomination to University College (then the University of London), at which he was entered on the 16th of January, 1832; and on a representation of his peculiar circumstances being laid before the Professors, they all most readily gave him gratuitous access to their respective lectures. There, besides attending to the ordinary branches of professional instruction, he became a diligent pupil in the class of Comparative Anatomy, under Dr. Grant. After the usual course of study, he received his qualification for practice both from the Company of Apothecaries and the College of Surgeons; and in April 1835 obtained the appointment of House Surgeon to the Chichester Infirmary. This appointment, slight as it was, may be said to have terminated his struggles for existence, and placed him, for the first time, in a position of comparative ease, security, and comfort. He, however, did not long retain the office, having resigned it in the beginning of 1837.

On leaving Chichester in January 1837, Mr. Newport returned to London, entering soon afterwards into partnership with a young Surgeon who had been for some time established in practice. This partnership continued several years, but was not productive of satisfactory results, either in a social or pecuniary point of view. On its dissolution, Mr. Newport became more and more occupied with his scientific pursuits, relishing his professional avocations less and less, and becoming, in some measure, unfitted for them, so that for a good many years before his death, the whole of his professional

income was almost exclusively derived from a single family, and never exceeded thirty pounds per annum. So circumstanced, his means were necessarily extremely circumscribed; but his habits were, happily, of the most frugal kind, and the most scanty lodging served him for all purposes of accommodation and study. But on the 1st July, 1847, Her Majesty was graciously pleased to grant him a pension of £100 a year, in consideration of his merits as a laborious and disinterested cultivator of science; and from this time, feeling his mind more tranquil in his improved worldly circumstances, he continued his labours more steadily and vigorously than ever, up to the day when he was stricken with his fatal illness.

That illness may truly be said to have been brought on by Mr. Newport's zeal for science. It had been his practice for some years to devote a day or two in the spring season to a search for frogs and other aquatic animals in the marsh lands west of London, in order to secure a supply of specimens for his physiological investigations. In these excursions he commonly contracted a cold, and on the last occasion this assumed the form of severe bronchitis, and being followed by fever of a typhoid character, terminated his valuable life on the 7th of April.

Mr. Newport was a member of the Entomological Society nearly from the time of its foundation, and during the sessions of 1844 and 1845 served the office of President. In 1847, he became a Fellow of the Linnean Society: the date of his election into the Royal Society is March 26, 1846. At the time of his death he was a Member of the Council.

The following is a list of Mr. Newport's writings:—

On the Nervous System of the *Sphinx Ligustri*. Phil. Trans. 1832.

On the Nervous System of the Sphinx (part ii.) during the latter stages of its Pupa and Imago states. Phil. Trans. 1834.

On the Respiration of Insects. Phil. Trans. 1836.

On the Habits of the Wasp. Trans. of Entom. Soc. vol. i.

On the Temperature of Insects. Phil. Trans. 1837.

Observations on the Anatomy, Habits and Economy of *Athalia centifolia*. Essay for Saffron Walden Society's Agricultural Prize. 1838.

The article "INSECTA" in the Cyclopædia of Anatomy and Physiology. 1839.

On the Organs of Reproduction and the Development of the Myriapoda. First Series. Phil. Trans. 1841. (Bakerian Lecture.)

On some new Genera of the class Myriapoda. Proc. of Zool. Soc. 1842.

On the Habits of Gregarious Insects. Trans. of Entom. Soc. vol. iii.

On the Habits of *Megachile centuncularis*. Trans. Entom. Soc. vol. iv.

On the Nervous and Circulatory Systems in Myriapoda and Macrourous Arachnida. Phil. Trans. 1843.

On the Existence of Branchiæ in a perfect Neuropterous Insect (*Pteronarcys regalis*). Ann. and Mag. Nat. Hist. 1843.

On the Means by which the Honey-bee finds its way back to the Hive. Trans. of Entom. Soc. vol. iv.

Monograph on the class Myriapoda; and a new arrangement of the class Articulata. (First and second Memoirs.) Trans. of Linn. Soc. vol. xix.

On the Reproduction of lost parts in Myriapoda and Insecta. Phil. Trans. 1844.

The Annual Address to the Entomological Society from its President. 1844.

On the Natural History, Anatomy and Development of the Oil Beetle, *Meloë*. (First and second Memoirs.) Trans. of Linn. Soc. vol. xx.

A List of the species of Myriapoda (order Chilopoda) in the British Museum, with a synoptic description of forty-seven new species. Ann. and Mag. Nat. Hist. 1845.

A List of the species of Myriapoda (order Chilognatha) in the British Museum, with descriptions of a new genus and thirty-two new species. Ann. and Mag. Nat. Hist. 1845.

A second Address to the Entomological Society. 1845.

On the Aqueous Vapour expelled from Bee-hives. Trans. of Linn. Soc. vol. xx.

Note on the Generation of Aphides. Trans. of Linn. Soc. vol. xx.

On the Formation and Use of the Air-sacs and Dilated Tracheæ in Insects. Trans. of Linn. Soc. vol. xx.

On the Anatomy and Affinities of *Pteronarcys regalis*, with the habits and descriptions of some American Perlidæ. Trans. of Linn. Soc. vol. xx.

The Anatomy and Development of certain Chalcididæ and Ichneumonidæ; with descriptions of a new genus and species of Bee-Parasites. Parts 1, 2 & 3. Trans. of Linn. Soc. vol. xxi.

On the Natural History, Anatomy and Development of *Meloë*. (Third Memoir.) Trans. of Linn. Soc. vol. xxi.

On the Identification of a new genus (*Anthophorabia*) of Parasitic Insects. Ann. and Mag. Nat. Hist. 1849.

Further observations on the genus *Anthophorabia*. Trans. of Linn. Soc. vol. xxi.

Further observations on the Habits of *Monodontomerus*. With some account of a new *Acarus* (*Heteropus ventricosus*). Trans. of Linn. Soc. vol. xxi.

On the Ocelli in the genus *Anthophorabia*. Trans. of Linn. Soc. vol. xxi.

On the Reciprocal Relation of the Vital and Physical Forces. Ann. and Mag. Nat. Hist. 1850.

On the Impregnation of the Ovum in the Amphibia. (First Memoir.) Phil. Trans. 1851.

On the Impregnation of the Ovum in the Amphibia. And on the Direct Agency of the Spermatozoon. (Second Memoir.) Phil. Trans. 1853.

On the Impregnation of the Ovum in the Amphibia, and on the early stages of Development of the Embryo. (Third Memoir.) Selected and arranged from the Author's MSS. after his death, by G. V. Ellis, Esq. Phil. Trans. 1854.

These publications, numerous as they are, were all produced within a period of two-and-twenty years. His more important researches were for the most part communicated to the Royal or Linnean Society, and on two different occasions they received the award of the Royal Medal.

His earliest inquiries were directed to the structure and economy of insects and other articulated animals, and his name first became generally known in science by his admirable memoirs on the Anatomy of the Nervous System of the *Sphinx Ligustri*, and the changes which that system undergoes during the metamorphosis of the insect. Continuing to prosecute these researches in the Crustaceans and other allied invertebrata, he arrived at the conclusion, that in all the higher Articulata, the central part of the nervous system consists of two pairs of cords, the one gangliated, the other not, which, in accordance with the views of Sir Charles Bell, he conceived to minister respectively to sensation and motion.

In a subsequent research on the nervous system of the *Iulus*, he observed in the central cords, a set of fibres which connect together adjacent nerves on the same side of the body, and then extend with them to the surface of the animal. These he regarded as associating in function the lateral nerves of the corresponding side, independently of the brain, in conformity with the views which were at

that time gaining acceptance on the mechanism of reflex action. In the same communication he related a remarkable set of experiments, showing the correspondence in function between the central part of the nervous system of the invertebrata and that of vertebrated animals.

The development of the embryo of the invertebrata largely occupied Mr. Newport's attention, and among other more or less valuable results of his inquiries, he made out the remarkable process of growth of the young Myriapod, by the interpolation of successive new segments at one determinate and limited region of the body. The paper in which these observations were communicated was nominated as the Bakerian Lecture for the year 1841.

In the latter years of Mr. Newport's suddenly interrupted life, he was led to investigate with his usual zeal and industry the recondite process of the impregnation of the ovum. He chose the egg of the Frog as the subject of his experiments, and recorded the results in three papers communicated to the Society, the last of which, partly prepared at the time of his death, and afterwards completed from his written memoranda by his friend Professor Ellis, is inserted in the present volume of the Philosophical Transactions. In his inquiries into this question he endeavoured to determine the several conditions which affect fecundation, whether depending on the state of the parent animals and their generative products or on the influence of extrinsic circumstances; but the main result at which he arrived was the confirmation, by his observations on the Frog, of the view already adopted by some physiologists on other evidence, that in the process of fecundation the spermatozoids actually reach the interior of the ovum.

In Mr. Newport's studies of insects and other invertebrated animals, it was more to his taste to investigate structure, function, and habits, than to occupy himself with zoological description and arrangement; but that he could ably deal with the classification and natural-history relations of animals is shown in his admirable monograph on the Myriapoda, in the Transactions of the Linnean Society.

Mr. Newport was endowed with singular aptitude for the pursuit he had chosen. His well-known skill of hand in minute anatomical research, and his ingenuity in devising and dexterity in

performing experiments, gave him great practical advantages; and these qualities were combined with patience and accuracy in observation, and fidelity in recording what he saw, apart from what he thought. He had a nervous temperament, which was, as usual, associated with mental activity, and in Mr. Newport this was rendered effective by immovable steadfastness of purpose and untiring power of sustained application.

Most faithful as an observer of nature, Mr. Newport was no less upright as a man. He was deservedly loved by those who knew him best, was most kind towards all who did him justice, and full of gratitude to those who had aided him in his early struggles.

By the death of Dr. WALLICH this Society has lost a highly distinguished Fellow and Vice-President, and the science of Botany one of its most zealous cultivators and ardent promoters.

Dr. Nathaniel Wallich was born at Copenhagen, on the 28th January 1786. He was educated for the medical profession and studied Botany under Vatel the eminent professor, at that time in the University of Copenhagen. In 1807 he entered the service of the Danish East India Company, and was stationed at Serampore. There his love of botany attracted the attention of Dr. Roxburgh, the superintendent of the Botanic Garden at Calcutta. After the seizure of Serampore by the British, Dr. Wallich was placed on the staff of assistant surgeons in the Bengal army, and his services secured for the Botanic Garden, to the temporary charge of which he was nominated in 1815, and finally confirmed in the appointment shortly afterwards. Before he had been four years in India, Dr. Wallich's ardour in the pursuit of his favourite science led to the first of a series of attacks of fever that gradually undermined his constitution, and in 1812 he repaired to the Mauritius for the renovation of his health. There he diligently explored the botany of the island, and contributed immense collections of live plants to Calcutta, thus early proving his ability to employ to the best interests of science the munificent allowances which were shortly afterwards placed at his disposal. At the head of the noblest botanical gardens in the world, supplied with a large staff of collectors and artists, and with provision for travelling expenses on a most liberal scale, Dr. Wallich applied himself with indomitable zeal and

industry to the extension of the gardens, the investigation of the East India Company's vast and then rapidly increasing dominions, and the establishment of a correspondence and exchange of living and dried plants, upon a scale which for magnitude and efficiency has never been surpassed by any scientific establishment whatever. During the first ten years of his incumbency he performed five extensive journeys; he visited Nepaul, then a terra incognita, in 1820-1822, and on his return through the pestilential Tarai, at the foot of the Himalayas, caught a second severe fever that obliged him to go to sea immediately after his arrival at Calcutta. This opportunity he turned to the best account, and as soon as he could rise from his bed and superintend his staff, he commenced diligently investigating the botany of the Bay of Bengal, Penang, and the Straits of Malacca.

Within less than another year Dr. Wallich was personally exploring the kingdom of Oude and the provinces of Rohilcund and Kamaon, reporting on their forests and other vegetable products; and in 1826-1827, he accompanied the British embassy to Burmah, visited Ava, and after that the newly-acquired provinces of Tenasserim and Martaban. Throughout this period he employed collectors in eastern Bengal, and in other parts of India which he could not himself visit; and he communicated (in the name of the Hon. E. I. Company) the products of these labours with a lavish liberality to the botanists of Europe, not only in the form of collections, but of voluminous observations and drawings.

Repeated attacks of illness obliged Dr. Wallich to repair to England, where he arrived on furlough in 1828, and applied himself assiduously for four years to the publication of his great work "*Plantæ Asiaticæ rariores*," in three volumes folio, and the distribution of his enormous collections to the principal public and private museums in Europe. This distribution, of which a catalogue was lithographed by his own hand, constitutes the most valuable contribution of its kind ever made to botanists, and is of itself a sufficient monument of one man's devotion to science.

Dr. Wallich returned to India in 1832, when it soon became apparent that his constitution was completely undermined by incessant labour of both mind and body. For several years he conducted the garden correspondence with his wonted zeal and vigour, and

according to official reports, the astonishing number of 190,000 live plants were distributed in the short space of five years, to upwards of 2000 gardens in India, Europe, North and South America, North and South Africa, and Australia. In 1835 he undertook to conduct a deputation to inquire into the prospects of tea cultivation in Assam, a most unhealthy country, and on this occasion superintended a botanical exploration of the whole valley. On his return to Calcutta he was again obliged to leave India for his health, and he repaired to the Cape of Good Hope, much enfeebled and in a very critical state; there however, with a partial restoration to health, his latent zeal revived, and he accompanied our eminent Fellow, Mr. Maclear the Astronomer Royal, upon an extensive journey into the interior of the colony, botanizing diligently as he went, and transmitting his collections to Europe for distribution with his wonted liberality.

After another short sojourn at Calcutta and ineffectual attempt to resist the effects of a climate which five times drove him from India, Dr. Wallich finally returned to England in 1847, relinquished with regrets (that he never could banish) his arduous duties, and retired upon the pension of his rank as Surgeon in the Bengal army, after forty years of such incessant toil both of mind and body as has never been paralleled in the history of botanical science.

After his return to England Dr. Wallich's health gradually declined, but his love of botany and earnest desire to promote it never forsook him. He took an active part in the meetings of our own and other societies, and contributed, chiefly literary notices, to various botanical periodicals. He maintained an extensive correspondence and became a medium of communication between men of science in all its branches, in this country and on the Continent; and up to within a few weeks of his decease, which took place at his residence in Gower Street on the 28th of April, he was actively engaged in establishing a correspondence between the museums and gardens of his native and adopted countries. Dr. Wallich published several important works on systematic botany in India, and a magnificent one in this country, to which allusion has already been made; he has further the merit of having introduced the art of lithography into the East. His acquirements as a botanist were both varied and sound, and not confined to a familiarity with species;

for he possessed great knowledge of the habits, economic and medicinal properties and uses of plants, drew up many valuable reports on the agricultural products and forests of India, and was very extensively read in the literature of the science. He was further an elegant scholar, a classical writer, and an accomplished European and Oriental linguist. His loss has been deeply felt by botanists of all classes, for he was always contributing information and materials to those engaged in the study of the most abstruse as well as the most popular branches of the science. It may truly be said that no one ever applied to him in vain, nor has a book of any importance been published on botany in Europe within the last thirty years, in which Dr. Wallich's name is not prominently introduced.

Dr. Wallich was a Doctor of Medicine and of Philosophy, Fellow of the Royal Danish Society of Copenhagen, a Correspondent of the Academies of Sciences of Paris and Berlin, and a member of most of the learned bodies of Europe. He was a Vice-President of the Linnean Society of London, and a Knight-Commander of the Danish Order of Dannebrog. He was elected a Fellow of this Society in March 1829, and nominated a Vice-President in 1852.

On the motion of the Rev. Baden Powell, seconded by Dr. Warren, the best thanks of the Society were given to the President for his excellent Address, and his Lordship was requested to permit the same to be printed.

The Statutes relating to the election of Officers and Council having been read, and Dr. Roget and Thomas Webster, Esq. having, with the consent of the Society, been nominated Scrutators, the votes of the Fellows present were collected.

The following Noblemen and Gentlemen were reported duly elected Officers and Council for the ensuing year :—

President—The Lord Wrottesley, M.A.

Treasurer—Colonel Edward Sabine, R.A.

Secretaries— { William Sharpey, M.D.
 { George Gabriel Stokes, Esq., M.A.

Foreign Secretary—Rear-Admiral W. H. Smyth.

Other Members of the Council.—Neil Arnott, M.D. ; Rear-Admiral